

## NANO-SIZE GAS SENSOR SYSTEMS

## 5 ABSTRACT OF THE DISCLOSURE

The present invention provides an apparatus and method for determining the presence and/or concentration gases using an optical response. These sensors may be very small, fast and low-cost. The preferred embodiment of the invention is accomplished by means of photon monitoring one or more sensors that respond to the target gas. For example by 1) passing the photons through the sensor, 2) multi-passes of a photon beam through the sensor, 3) by evanescent field absorption (EFA) and 4) by using index of refraction changes to switch the photon from one path to another.

15 Rapid detection of gases such as CO can be made by multiple passes of photons through a sensor that is absorbing photons of that wavelength range. The photon beam is passed back and forth through the sensor by some means such as using highly reflective optical surfaces or cavity. In essences the multiple internal reflections in a waveguide are similar to the multi-pass photon method except that the evanescent method only penetrates about 200 nm. The EFA detection system comprises a photon source optically coupled to the sensor and photodiode system, so that the photon flux is a function of at least one other sensor's response to the target gas, e.g., transmits light through the sensor to the photodiode.

25 In addition, a sensor that changes its index upon exposure to a target gas such CO may be used to switch photons from one waveguide to another proportional to the index changes which is in tern proportional to the concentration of the target gas. Each waveguide may have a different index of refraction and the sensor is in close proximity to both waveguides.